

2016 SOFIA Guest Investigator Survey

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1) Survey Purpose

This survey of SOFIA Guest Investigators was initiated in response to a SOFIA program action item arising at an offsite meeting, where it was determined that we should assess the satisfaction of SOFIA observers with the data processing effort. Three questions related to SOFIA data processing form the core of this survey and are analyzed in this report. In order to capture the time in which the quest investigator's project was executed, and the scientific instrument used, both of which are critical for determining the maturity of the system at the time of their service, we include preamble questions that capture basic information.

Finally, we also added questions to address the top scientific priority of the mission, which is to generate publications and scientific results from the data. These questions were intended to supplement the already-ongoing collection of status information as well as to directly link publication progress with data products, if such a link exists.

2) Survey Design

The questions were designed to be straightforward in order to maximize the response rate. Many observers had already received inquiries from the Science Center about the publication status of their programs, so we did not require a detailed response but rather a multiple-choice format in order to capture responses. The survey was designed, collected, and analyzed using SurveyMonkey. The format was optimized for display and response on both desktop and mobile devices, to maximize probability of reply.

1. Which Observing Cycle was your proposal submitted to?

Cycle 1 Cycle 2 Cycle 3 Cycle 4

2. What was your proposal number?

Enter the last 4 digits, e.g. for Program 02_1234 enter 1234.

3. Which Science Instrument was used?

If multiple instruments, check the box for the primary science instrument, or submit this survey for each science instrument separately.

FORCAST GREAT FLITECAMEXES FIFI-LS

4. What is the publication status of this project?

- Publication(s) complete
- Published part of project and working on more
- First paper in preparation
- Plan to publish in the future (please specify approximately when, in the field below)
- No plans to publish results

Optional details

[THE FOLLOWING QUESTION ONLY APPEARS IF QUESTION 4 RESPONSE WAS “NO PLANS TO PUBLISH”]

5. Please specify the reason you do not plan to publish your results

- The proposed observations were not completed
- The observations were not of high enough quality to meet the proposed goals (signal-to-noise, angular resolution, spectral resolution)
- Results not publishable despite meeting proposed goals (e.g. target fainter than predicted)
- The project is not high enough priority compared to other commitments

6. Did you receive data products from the SOFIA science center?

- Yes No (optionally, explain in a comment at the end of the survey)

[THE FOLLOWING 3 QUESTIONS ONLY APPEAR IF QUESTION 6 RESPONSE WAS “YES”]

7. How satisfied were you with the TIMING of your data product deliveries?

Specifically, let us know your opinion of whether you received the data products quickly enough for you to get your results analyzed and published in a timely manner.

- Very satisfied
- Satisfied
- Indifferent
- Not satisfied
- Very unsatisfied

Optional additional comments...

8. How satisfied were you with the FORMAT of your data products delivered through the archive?

Specifically, tell us your opinion of the file types, number of files, completeness, comprehensibility of the data delivery.

- Very satisfied
- Satisfied
- Indifferent
- Not satisfied
- Very unsatisfied

Optional additional comments...

9. How satisfied were you with the QUALITY, including calibration, of your data products?

Specifically, tells us your opinion of how well the data delivery quantifies the results of your observation such that you could use it in your analysis and publication of the results.

Very satisfied Satisfied Indifferent Not satisfied Very unsatisfied
Optional additional comments...

10. Do you have any general comments you would like to make regarding SOFIA's services to observers?

Remember you can always send your questions or comments to sofia_help@sofia.usra.edu.

3) Survey Execution

The survey was emailed to SOFIA Guest Investigator of Cycle 1-4 programs that received data for a reasonable portion of their observing programs. Of the science instruments, HIPO programs were excluded because they do not generate data products beyond the raw files; FLITECAM exoplanet and occultations were also excluded because of their usage of nonstandard observing modes. When a guest investigator had multiple programs, a single email was sent. The emails contained the IDs of each of their programs and requested they submit a survey for each. Observers were requested to click the inline survey form in the email for their first program (the vast majority having only one program), which enabled me to track whether they responded. They were also provided a URL to provide additional responses. A reminder was sent on 12/13/2016 to 81 of the respondents who had not yet clicked through their survey email.

Figure 1 shows the number of responses per day, clearly revealing the initial spike of prompt responses with a 2-day tail, and the secondary spike produced by the reminder email. This report is based on the 84 responses as of 12/23/2016.

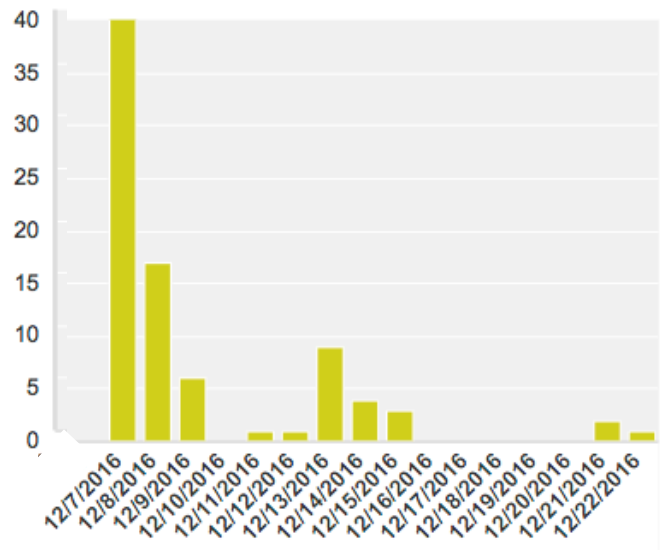


Figure 1. Survey responses per day

4) Analysis of Results: Publication Status

The analysis of publication status of SOFIA projects is an ongoing effort for which the present survey serves as a supplemental component to the one-on-one contacts with each guest investigator. In this analysis we will briefly summarize the key results, with the ongoing analysis being routinely reported to the SOFIA Users Group at its biannual meetings.

The responses to the questions are summarized in [Table 1](#) and illustrated in [Figure 2](#).

Table 1. Publication status statistics

STATUS	Number	Percent
Publication(s) complete	12	15%
Published part of project and working on more	3	4%
First paper in preparation	29	37%
Plan to publish in the future	23	29%
No plans to publish results	12	15%

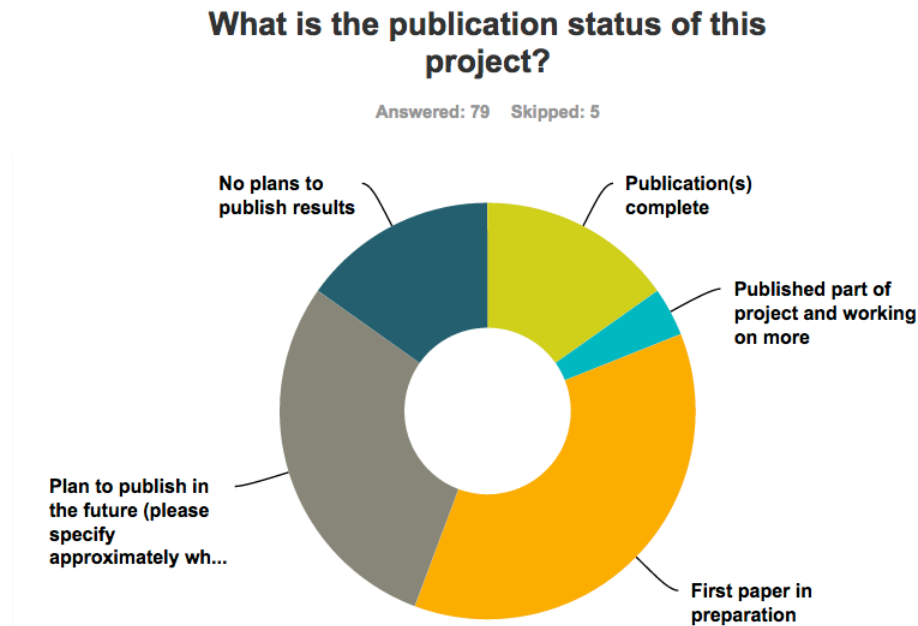


Figure 2. Publication status of each project

a) Publication rate

Of the 79 guest investigators who responded to this question, 15 (19%) indicated their projects had one or more publications. Not surprisingly, the bulk (12) of these were from Cycles 1 and 2. The publication production rate can be determined from the number of projects reporting publications divided by the number of total respondents. Table 2 shows the results. We conclude that
 (1) programs are only matured through to completion two Cycles following their execution; and
 (2) the publication rate for mature programs is less than 50%.

Table 2. Publication rate by Cycle

Cycle	Programs	Programs w/Pubs	Fraction w/Pubs
1	14	6	43%
2	14	6	43%
3	25	1	4%
4	31	2	6%

b) Why some GI's have no plans to publish

To understand why there are many programs that are not being published, we first consider the responses to our question directly asking observers why they have no plans to publish. Table 3 summarizes the 12 responses. Half of them indicated the program were not complete. The question requires further analysis, which shows that it does not address the issue of scientific publication productivity of mature projects. Only 1 guest investigator from Cycles 1&2 responded that they had no plans to publish their results; the other 11 were from Cycle 3 (9 responses) and Cycle 4 (2). The stand-out science instrument is FIFI-LS (6).

Table 3. Responses to "Why do you have no plans to publish?"

Answer Choices	Responses
▼ The proposed observations were not completed	50.00% 6
▼ The observations were not of high enough quality to meet the proposed goals (signal-to-noise, angular resolution, spectral resolution)	25.00% 3
▼ Results not publishable despite meeting proposed goals (e.g. target fainter than predicted)	16.67% 2
▼ The project is not high enough priority compared to other commitments	8.33% 1
Total	12

From Table 3 **the main reason for GIs not planning to publish is that their projects were not completed.** We verified that with individual cases studies. When even just one flight in a series is cancelled, it has a disproportionate effect because most observing programs are scheduled in multiple flights within a series. We have

attempted to address the issue in the Cycle 4 scheduling process by including contingency flights in the flight series.

Three responses indicated the observations were not of high enough quality to meet the goals. These were all FIFI-LS projects. One indicated “It is not clear if the lines are detected or not”; another “Bad atmosphere with high opacity taken at beginning of flights looks to not be usable”; and another “Attempt to measure very large-scale emission appears not have been successful”. The first comment indicates the observer’s predicted line brightness was probably too low, or the experiment was not designed such that an upper limit was useful. The second comment indicates poor observing conditions made the results insensitive. The third indicates attempt to measure large-scale emission which is not a strength of FIFI-LS, though the instrument team has designed and is testing (early 2017) a total-power mode that would enable such measurements. The community will continue to use FIFI-LS incorrectly until we publish some specific quantitative results on its performance and show some actual data in scientific publications. **We must encourage FIFI-LS spectroscopy papers be published; the current zero publications is making it difficult for the community to correctly utilize the instrument.**

F2

Two responses indicated the observations would not be published despite meeting the proposed goals (e.g. the source was fainter than expected); they offered no comments. Both were Cycle 4, one GREAT and one FIFI-LS. The GREAT project was a 1-hr map, and it is likely (based on reading the proposal) the reason for the result not being published is that the proposal was for a minor, incremental result to an ongoing program rather than an experiment designed to test a hypothesis and provide a result. **The Time Allocation Committee should be reminded not to accept results that do not have a path toward publication of a specific result.** The FIFI-LS project in this category is likely not publishable due to the source being fainter than predicted and the upper limit being exceptionally difficult to interpret; this is a natural part of scientific exploration and is to be anticipated.

F3

5) Analysis of Results: Data Deliveries

All SOFIA Guest Investigators are to receive data products from the science center, except HIPO observations, those using non-standard modes that are not amenable to processing, or failed observations. In fact, 24% of observers did not receive their products from the science center archive but instead received them directly from science instrument teams. We did not include HIPO or failed programs in the survey. The vast majority of those who did not use products from the science center were GREAT observers (15/19), and the others were from EXES (3) or FIFI-LS (1). There were no comments indicating dissatisfaction with the level of service from these observers who received their products directly from the SI teams.

a) Overall satisfaction with data deliveries

The satisfaction level with data products from the science center was overall very high. Those receiving data products directly from the science instrument team must

have been satisfied or they would have requested assistance or provided feedback to the survey. Including all of those respondents, the satisfaction rate (i.e. the percentage of users who were not dissatisfied) was 84% for Timing, 93% for Format, and 86% for Quality. This result is in keeping with the positive feedback received from the SOFIA Users Group. We strive for the highest satisfaction level; therefore, we will delve into the *dissatisfaction* results in detail, but it must be emphasized that these are a small fraction of observers who may receive disproportionate attention as we strive for complete satisfaction.

b) Dissatisfaction with Timing of data deliveries

Of those who received products from the science center, 16% were dissatisfied with the timing of their data deliveries. The dissatisfaction with timing has been noticed before, including by the NASA Inspector General, which resulted in considerable attention to this issue.

We might suspect this problem is decreasing with time, as the system matures. In fact, the survey shows this has not yet occurred, despite significant advances at the science center. From Cycles 1&2, the dissatisfaction rate was 7% (2/28), while from Cycles 3&4, it was 12% (7/56).

The dissatisfied observers were all FORCAST observers in Cycles 1&2, and there were zero dissatisfied FORCAST observers in Cycles 3&4. So the FORCAST issue was solved and the survey clearly reflects this result. In the meantime, FIFI-LS came on line and was not mature. All of the dissatisfaction in Cycles 3&4 was from FIFI-LS observers. The routine delivery of FIFI-LS data products began in mid-Cycle 4 and has not had time to affect this survey. The one comment from a Cycle 4 observer dissatisfied with Timing of data deliveries was, "I had hoped to go to the January 2017 AAS meeting but didn't get the data early enough." I inspected this result in the DCS for details. Observations for that observer occurred on July 5, 2016 (during OC4F). The baseline scheduled data processing completion date was Sep 8, 2016, and Level 3 data products were in the archive on Nov 8, 2016, which was too late to meet the AAS presentation deadline. If the science center had delivered on its fully-mature timescale of 2 weeks after the end of flight series, the data products would have been available by the end of July, and that observer may have been able to make the AAS presentation deadline. **We therefore receive this feedback as indicating just how important it is to get data deliveries out on time**, and this problem is of high priority for the FIFI-LS Principal Investigator and the science center data processing team.

F4

For future science instruments, we can anticipate a longer delivery time for data products, and we should take that into account when setting expectations for guest investigators. For mature science instruments, the science center is already delivering on a satisfactory timescale.

c) Dissatisfaction with Format of data deliveries

There were only 4 respondents dissatisfied with data format: two each for FORCAST and GREAT observers. The detailed comments indicate the dissatisfaction was due to delivery of the data products in CLASS format, which requires specialized data reduction experience. Given the modest number of these complaints, compared to the relative groundswell of support for making CLASS the primary data delivery format, **we believe the best course of action is to provide a beginners guide to data reduction with CLASS and any other custom data reduction software required for future SOFIA science instruments.**

d) Dissatisfaction with quality of data deliveries

This question was phrased as follows: “How satisfied were you with the QUALITY, including calibration, of your data products? Specifically, tells us your opinion of how well the data delivery quantifies the results of your observation such that you could use it in your analysis and publication of the results.”

There were no significant trends with regard to Cycle or Science Instrument. From Cycles 1&2, there were 28 respondents with 11% (3) being dissatisfied, and they used FORCAST (2) and EXES (1). From Cycles 3&4, there were 56 respondents with 11% (5) dissatisfied, and they used FIFI-LS (2), FORCAST (1), and GREAT (1). Of the total 7 dissatisfied respondents, all but one plan to publish their results, with one paper already in preparation.

Table 4 summarizes the detailed comments from observers. Issue 1 is a problem with the sensitivity calculator as opposed to the data processing. Issues 2 and 3 relate to the accuracy of telescope pointing reporting as opposed to the data processing. Issue 5 is known and under development. Issue 7 will be reported to the GREAT team. Issue 8 is a general problem that observers will need to work with the instrument team to obtain quality data; the alternative was to not deliver products with standing waves, but that is unacceptable because many scientific projects are immune to such artifacts.

Table 4. Satisfaction with Data Quality

Science Instrument	Data Quality Dissatisfaction Comment
1 FORCAST	the signal/noise was 5 times worse than the sensitivity FORCAST calculator
2	the science would be unreliable for the unsuspecting archive user, with the astrometry in its released state, including confusion between the ON / OFF phases
3	knowledge of where the slit intersected the nebula was critical but the WCS was not well enough known [project incomplete/no plan to publish]
4	I need to iterate with the SOFIA folks on a couple of troublesome spectra. It's not their fault that I have not yet done

		that
5	FIFI-LS	The flat field needs to be improved
6		hopefully properly reduced data available since 16 Nov 2016
7	GREAT	I cannot really use it. I need to perform extra tests regarding background correction and extraction of the lines profiles
8	EXES	the products were not publication-ready due to standing waves

6) Comments from Guest Investigators not already Addressed

In addition to the comments already addressed in the specific analyses earlier in this report, there were others entered into free text comment boxes that we describe here. In response to the Publication Status question, there were 43 text comments. All of these have been recorded into the master spreadsheet that compiles guest investigator publication progress, so they will be taken into account when we contact observers in the future.

7) Summary of findings

F1: the main reason for GIs not planning to publish is that their projects were not completed

F2: We must encourage FIFI-LS spectroscopy papers be published; the current zero publications is making it difficult for the community to correctly utilize the instrument.

F3: The Time Allocation Committee should be reminded not to accept results that do not have a path toward publication of a specific result.

F4: We therefore receive this feedback as indicating just how important it is to get data deliveries out on time

F5: we believe the best course of action is to provide a beginners guide to data reduction with CLASS and any other custom data reduction software required for future SOFIA science instruments